APPENDIX A

FOIA/PA-2006-069

Phonics Blocks, Phonetic Generalizations Outlined

Pass 1: The first pass for each letter assigns the normal sound for that letter

Pass 2:
When two of the same consonants appear side by side, only one is heard.
Example: "berry"

Pass 3:
'ch' = /ch/, phoneme #19
Example: cherry

Pass 4:
When the letters 'ght' are together, 'g' and 'h' are silent.
Example: 'night'

Pass 5:
The letter 'g' makes a soft sound before the letters 'e' and 'i'.
Example: "gem"

Pass 6:
The letter 'c' makes a soft sound before the letters 'e' and 'i'.
Example: "cent"

Pass 7:
When a word ends in 'ck', it has the /k/ sound.
Example: "sick"

Pass 8:
When a word begins with 'kn', the letter 'k' is silent.
Example: "know"

Pass 9:
When a word begins with 'wr', the letter 'w' is silent.
Example: "write"

Pass 10:
Words having a double 'e', usually have the long 'e' sound.
Example: "feet"

Passes 11 & 12:
The letter 'r' changes the quality of the preceding vowel.
Example: "burn"

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Pass 13:
When the letter 'y' is the final vowel in a word, it usually has a vowel sound.
Example: "why"

Pass 14:
In 'ay', the 'y' is silent and gives 'a' its long sound.
Example: "play"

Pass 15:
If the only vowel is the final letter, it usually represents its long vowel sound.
Example: 'me'

Pass 16:
When the letter 'i' is followed by the letters 'gh', the 'i' is long and the 'g' and 'h' are silent.
Example: 'sigh'

Pass 17:
When two 'o's are next to each other, they represent the phoneme #43.
Example: 'moon'

Pass 18:
When the letters 'e' and 'w' are next to each other, they represent the phoneme #43.
Example: 'dew'

Pass 19:
When there is a 'u' followed by a consonant and an 'e', the 'u' represents the phoneme #43.
Example: 'dude'

Pass 20:
When the letters 'o' and 'u' are next to each other (in the form 'ou'), they represent the phoneme #42.
Example: 'proud'

Pass 21:
When the letter 'n' is directly preceded by 'g', the 'g' is silent.
Example: 'gnu'

Pass 22:
When the letter 'y' is directly preceded by 'o', they represent the phoneme #41.
Example: 'boy'

Pass 23:

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When the letter 'h' is directly preceded by the letter 'w', they represent the phoneme #24.
Example: 'who'

Pass 24:
Silent 'e' - makes the preceding vowel long (when there is a consonant between the two).
Example: "name"

Pass 25:
When a word ends in 'ed', the preceding vowel represents its long vowel sound.
Example:

Pass 26:
When a word ends in 'es', the preceding vowel represents its long vowel sound.
Example:

Pass 27:
When a word ends in 'er', the preceding vowel represents its long vowel sound.
Example:

Pass 28:
When the letter 'u' is directly preceded by 'q', the 'q' represents phoneme #7 (/k/) and the 'u' represents the phoneme #16 (/w/).
Example: 'quilt'

Pass 29:
When the letter 'p' is directly followed by the letter 'h', they represent phoneme #3 (/f/).
Example: 'phonics'

Pass 30:
When the letter 'n' is directly followed by the letter 'g', the 'n' represents phoneme #25 and the 'g' is silent. *Note, this needs to be changed in the code.
Example: 'phonics'

Pass 31:
When the letter 's' is directly followed by the letter 'h', they represent the phoneme #20.
Example: 'shut'

Pass 32:
When the letter 't' is directly followed by the letter 'h', they represent the phoneme #22.
Example: 'the'

Pass 33:
When the letter 'a' is directly followed by the letter 'w', they represent the phoneme #40.

Example: 'draw'

Pass 34:
When the letter 'a' is directly followed by the letter 'i', they represent the phoneme #26.
Example: 'paid'

Pass 35:
When the letter 'o' is directly followed by the letter 'a', they represent the phoneme #29.
Example: 'boat'

Pass 36:
When the letter 'e' is directly followed by the letter 'a', they represent the phoneme #27.
Example: 'pea'

Pass 37:
When the letters 'ould' appear in this order, they represent the phoneme sequence 44, 44, 0, 2
Example: 'could'

Pass 38:
When the letters 'tion' appear in this order, they represent the phoneme sequence 20, 20, 36, 10
Example: 'nation'

Pass 39:
When the letters 'sion' appear in this order, they represent the phoneme sequence 20, 20, 36, 10
Example: 'tension'

Pass 40:
When there are two 'c's followed by 'e' or 'i', the first 'c' represents a hard sound (/k/), and the second 'c' represents a soft sound (/s/).
Example: 'success'

Pass 41:
When the letter 'o' is directly followed by the letter 'i', they represent the phoneme #41.
Example" 'foil'

Pass 42:
When 's' is the last letter in a word, it represents the sound /z/.
Example: 'faces'

Pass 43:
When the letters 'tch' appear in this order, the 't' is silent.

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Example: 'itch'

Pass 44:
When the letters 'r' or 'k' are directly followed by 'h', the 'h' is silent.
Example: 'rhino'

Pass 45:
When the letter 'm' is directly followed by the letter 'b', the 'b' is silent.
Example: 'lamb'

Pass 46:
When the letters 'k' or 'm' are directly preceded by the letter 'l', the 'l' is silent.
Example: 'talk', 'calm'

Pass 47:
When the letter 'b' is directly followed by the letter 't' at the end of a word, the 'b' is silent.
Example: 'debt'

Pass 48:
When the letter 'm' is directly followed by the letter 'n', the 'n' is silent.
Example: 'hymn'

Pass 49:
When an 'h' is the last letter of a word and is directly preceded by a vowel, the 'h' is silent.
Example: '

Pass 50:
When the string of letters 'who' are at the beginning of a word, the 'w' is silent.
Example: 'who'

Pass 100:
When the letter 'd' is directly followed by the letter 'g' or the letter 'j', the 'd' is silent.
Example: 'judge', 'adjust'

Pass 101:
When the letter 's' is directly followed by the letter 'm' at the end of a word, the 's' has a /z/ sound.
Example: 'chasm'

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APPENDIX B

E-5656-2" +/-3%-6-60

```
/vpass1 {
        0 1     wlen {
                /x exch def
                workingvword 1 get                      // array
                x                                               // array int
                Alphabet word x get get                 // array int dict
                /snorm get                                      // array int string
                put
                workingvword 2 get
                x 1 x bitshift put
        } for
} def

        // double consonants
/vpass2 {
        /prev '.' def
        0 1     wlen {
                /x exch def
                word x get prev eq {
                        x x 1 sub light2gether
                } if
                /prev word x get def
        } for
} def

        // ch
/vpass3 {
        /prev '.' def
        0 1     wlen {
                /x exch def
                word x get 'h' eq prev 'c' eq and {
                        x x 1 sub light2gether
                        "19" x soundlikethis
                        "19" x 1 sub soundlikethis
                } if
                /prev word x get def
        } for
} def

        // ght
/vpass4 {
        2 1     wlen {
                /x exch def
                word x get 't' eq {
                        word x 1 sub get 'h' eq
                        word x 2 sub get 'g' eq
```

```
                    and {
                        x x 1 sub x 2 sub light3gether
                        "0" x 1 sub soundlikethis
                        "0" x 2 sub soundlikethis
                    } if
                } if
        } for
} def

        // soft 'g'
/vpass5 {
        0 1     wlen 1 sub {
                /x exch def
                word x get 'g' eq {
                    word x 1 add get 'i' eq
                    word x 1 add get 'e' eq
                    or {
                        x x 1 add lightthistoo
                        "6" x soundlikethis
                    } if
                } if
        } for
} def

        // soft 'c'
/vpass6 {
        0 1     wlen 1 sub {
                /x exch def
                word x get 'c' eq {
                    word x 1 add get 'i' eq
                    word x 1 add get 'e' eq
                    or {
                        x x 1 add lightthistoo
                        "13" x soundlikethis
                    } if
                } if
        } for
} def

        // 'ck' at the end
/vpass7 {
        word wlen 2 sub get 'c' eq {
                word wlen 1 sub get 'k' eq {
                    wlen 2 sub wlen 1 sub light2gether
                    "7" wlen 2 sub soundlikethis
```

```
                "7" wlen 1 sub soundlikethis
            } if
        } if
} def

        // 'kn' at the beginning
/vpass8 {
        word 0 get 'k' eq {
            word 1 get 'n' eq {
                0 1 lightthistoo
                "0" 0 soundlikethis
            } if
        } if
} def

        // 'wr' at the beginning
/vpass9 {
        word 0 get 'w' eq {
            word 1 get 'r' eq {
                0 1 lightthistoo
                "0" 0 soundlikethis
            } if
        } if
} def

        // double e
/vpass10 {
        /prev '.' def
        0 1     wlen {
            /x exch def
            word x get 'e' eq prev 'e' eq and {
                x x 1 sub light2gether
                "27" x soundlikethis
                "27" x 1 sub soundlikethis

            } if
            /prev word x get def
        } for
} def

        // vowel preceeds 'r'
/vpass11 {
        1 1     wlen {
            /x exch def
            word x get 'r' eq {
```

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```
                        word x 1 sub get 'i' eq {
                                "38" x soundlikethis
                                "38" x 1 sub soundlikethis
                                x 1 sub x lightthistoo
                        } if
                        word x 1 sub get 'u' eq {
                                "38" x soundlikethis
                                "38" x 1 sub soundlikethis
                                x 1 sub x lightthistoo
                        } if
                        word x 1 sub get 'e' eq {
                                "38" x soundlikethis
                                "38" x 1 sub soundlikethis
                                x 1 sub x lightthistoo
                        } if
                        word x 1 sub get 'a' eq {
                                "39" x soundlikethis
                                "39" x 1 sub soundlikethis
                                x 1 sub x lightthistoo
                        } if
                        word x 1 sub get 'o' eq {
                                "48" x soundlikethis
                                "48" x 1 sub soundlikethis
                                x 1 sub x lightthistoo
                        } if
                } if
                /prev word x get def
        } for
} def

/vpass12 {
        1 1     wlen 1 sub {
                /x exch def
                word x get 'r' eq  word x 1 add get 'e' eq and {
                        word x 1 sub get 'a' eq {
                                // the 'a'
                                "37" x 1 sub soundlikethis
                                x 1 sub x lightthistoo
                                x 1 sub x 1 add lightthistoo
                                // the 'e'
                                "0" x 1 add soundlikethis
                                x 1 add x 1 sub lightthistoo
                        } if
                        word x 1 sub get 'o' eq {
                                "48" x 1 sub soundlikethis
```

Exhibit "A" to Stipulation

```
                        x 1 sub x lightthistoo
                        x 1 sub x 1 add lightthistoo
                        // the 'e'
                        "0" x 1 add soundlikethis
                        x 1 add x 1 sub lightthistoo
                    } if
                } if
                /prev word x get def
        } for
} def

/vpass13 {
        word wlen 1 sub get 'y' eq {
                countvowels 0 eq {
                        "28" wlen 1 sub soundlikethis

                }{
                        "27" wlen 1 sub soundlikethis

                } ifelse
        } if
} def

/vpass14 {
        1 1     wlen {
                /x exch def
                word x get 'y' eq {
                        word x 1 sub get 'a' eq {
                                "26" x 1 sub soundlikethis
                                "0" x  soundlikethis
                                x x 1 sub light2gether
                        } if
                } if
        } for
} def

/vpass15 {
        countvowels 1 eq {
                /pos wlen 1 sub def
                /letter word wlen 1 sub get def
                letter 'e' eq {
                        "27" pos soundlikethis
                } if
                letter 'i' eq {
                        "28" pos soundlikethis
```

```
                } if
                letter 'o' eq {
                        "29" pos soundlikethis
                } if
        } if
} def

/vpass16 {
        2 1     wlen {
                /x exch def
                word x get 'h' eq  word x 1 sub get 'g' eq and {
                        word x 2 sub get 'i' eq {
                                "0" x soundlikethis
                                "0" x 1 sub soundlikethis
                                "28" x 2 sub soundlikethis
                                x x 1 sub x 2 sub light3gether
                        } if
                } if
        } for
} def

        // double o
/vpass17 {
        /prev '.' def
        0 1     wlen {
                /x exch def
                word x get 'o' eq prev 'o' eq and {
                        x x 1 sub light2gether
                        "43" x soundlikethis
                        "43" x 1 sub soundlikethis

                } if
                /prev word x get def
        } for

} def

        // ew
/vpass18 {
        1 1     wlen {
                /x exch def
                word x get 'w' eq word x 1 sub get 'e' eq and {
                        x x 1 sub light2gether
                        "43" x soundlikethis
                        "43" x 1 sub soundlikethis
```

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```
                } if
        } for
} def

        // u consonant e
/vpass19 {
        2 1     wlen {
                /x exch def
                word x get 'e' eq word x 2 sub get 'u' eq and {
                        word x 1 sub get isconsonant {
                                x x 2 sub light2gether
                                "0" x soundlikethis
                                "43" x 2 sub soundlikethis
                        } if
                } if
        } for
} def

        // 'ou'
/vpass20 {
        1 1     wlen {
                /x exch def
                word x get 'u' eq word x 1 sub get 'o' eq and {
                        x x 1 sub light2gether
                        "42" x soundlikethis
                        "42" x 1 sub soundlikethis
                } if
        } for
} def

        // 'gn'
/vpass21 {
        1 1     wlen {
                /x exch def
                word x get 'n' eq word x 1 sub get 'g' eq and {
                        x 1 sub x lightthistoo
                        "0" x 1 sub soundlikethis
                } if
        } for
} def

        // oy
/vpass22 {
        0 1     wlen 1 sub {
                /x exch def
```

```
                word x get 'o' eq
                word x 1 add get 'y' eq and {
                        "41" x soundlikethis
                        "41" x 1 add soundlikethis
                        x x 1 add light2gether
                } if
        } for
} def


        // 'wh'
/vpass23 {
        /prev '.' def
        0 1     wlen {
                /x exch def
                word x get 'h' eq prev 'w' eq and {
                        x x 1 sub light2gether
                        "24" x soundlikethis
                        "24" x 1 sub soundlikethis
                } if
                /prev word x get def
        } for
} def

        // silent 'e' at end
/vpass24 {
        word wlen 1 sub get 'e' eq {
                countvowels 2 eq {
                        word wlen 2 sub get isconsonant {
                                "0" wlen 1 sub soundlikethis
                                0 1 wlen 2 sub {
                                        /x exch def
                                        /letter word x get def
                                        letter 'a' eq {
                                                "26" x soundlikethis
                                                wlen 1 sub x light2gether
                                        } if
                                        letter 'e' eq {
                                                "27" x soundlikethis
                                                wlen 1 sub x light2gether
                                        } if
                                        letter 'i' eq {
                                                "28" x soundlikethis
                                                wlen 1 sub x light2gether
                                        } if
```

```
                                letter 'o' eq {
                                        "29" x soundlikethis
                                        wlen 1 sub x light2gether
                                } if
                                letter 'u' eq {
                                        "43" x soundlikethis
                                        wlen 1 sub x light2gether
                                } if
                        } for
                } if
        } if
} def

        // ed
/vpass25 {
        word wlen 1 sub get 'd' eq word wlen 2 sub get 'e' eq and {
                countvowels 2 eq {
                        word wlen 3 sub get isconsonant {
                                "0" wlen 2 sub soundlikethis  // e silent
                                0 1 wlen 3 sub {
                                        /x exch def
                                        /letter word x get def
                                        letter 'a' eq {
                                                "26" x soundlikethis
                                                wlen 2 sub x light2gether
                                        } if
                                        letter 'e' eq {
                                                "27" x soundlikethis
                                                wlen 2 sub x light2gether
                                        } if
                                        letter 'i' eq {
                                                "28" x soundlikethis
                                                wlen 2 sub x light2gether
                                        } if
                                        letter 'o' eq {
                                                "29" x soundlikethis
                                                wlen 2 sub x light2gether
                                        } if
                                        letter 'u' eq {
                                                "43" x soundlikethis
                                                wlen 2 sub x light2gether
                                        } if
                                } for
                        } if
```

Exhibit "A" Page 7 of 50

```
                } if
        } if
} def

        // es
/vpass26 {
        word wlen 1 sub get 's' eq word wlen 2 sub get 'e' eq and {
                countvowels 2 eq {
                        word wlen 3 sub get isconsonant {
                                "0" wlen 2 sub soundlikethis  // e silent
                                0 1 wlen 3 sub {
                                        /x exch def
                                        /letter word x get def
                                        letter 'a' eq {
                                                "26" x soundlikethis
                                                wlen 2 sub x light2gether
                                        } if
                                        letter 'e' eq {
                                                "27" x soundlikethis
                                                wlen 2 sub x light2gether
                                        } if
                                        letter 'i' eq {
                                                "28" x soundlikethis
                                                wlen 2 sub x light2gether
                                        } if
                                        letter 'o' eq {
                                                "29" x soundlikethis
                                                wlen 2 sub x light2gether
                                        } if
                                        letter 'u' eq {
                                                "43" x soundlikethis
                                                wlen 2 sub x light2gether
                                        } if
                                } for
                        } if
                } if
        } if
} def

        // er
/vpass27 {
        word wlen 1 sub get 'r' eq word wlen 2 sub get 'e' eq and {
                countvowels 2 eq {
                        word wlen 3 sub get isconsonant {
                                "38" wlen 1 sub soundlikethis          //
```

```
                        "38" wlen 2 sub soundlikethis          //
                        wlen 1 sub wlen 2 sub light2gether

                        0 1 wlen 3 sub {
                                /x exch def
                                /letter word x get def
                                letter 'a' eq {
                                        "26" x soundlikethis
                                        x wlen 2 sub lightthistoo
                                } if
                                letter 'e' eq {
                                        "27" x soundlikethis
                                        x wlen 2 sub lightthistoo
                                } if
                                letter 'i' eq {
                                        "28" x soundlikethis
                                        x wlen 2 sub lightthistoo
                                } if
                                letter 'o' eq {
                                        "29" x soundlikethis
                                        x wlen 2 sub lightthistoo
                                } if
                                letter 'u' eq {
                                        "30" x soundlikethis
                                        x wlen 2 sub lightthistoo
                                } if
                        } for
                } if
        } if
} def

        // qu
/vpass28 {
        0 1     wlen 1 sub {
                /x exch def
                word x get 'q' eq  word x 1 add get 'u' eq and {
                        "46" x soundlikethis
                        "46" x 1 add soundlikethis
                        x x 1 add light2gether
                } if
        } for
} def

        // ph
```

```
/vpass29 {
        0 1     wlen 1 sub {
                /x exch def
                word x get 'p' eq  word x 1 add get 'h' eq  and {
                        x x 1 add light2gether
                        "3" x soundlikethis
                        "3" x 1 add soundlikethis
                } if
        } for
} def

        // ng
/vpass30 {
        0 1     wlen 1 sub {
                /x exch def
                word x get 'n' eq  word x 1 add get 'g' eq  and {
                        x x 1 add light2gether
                        "25" x soundlikethis
                        "25" x 1 add soundlikethis
                } if
        } for
} def

        // sh
/vpass31 {
        0 1     wlen 1 sub {
                /x exch def
                word x get 's' eq  word x 1 add get 'h' eq  and {
                        x x 1 add light2gether
                        "20" x soundlikethis
                        "20" x 1 add soundlikethis
                } if
        } for
} def

        // th
/vpass32 {
        0 1     wlen 1 sub {
                /x exch def
                word x get 't' eq  word x 1 add get 'h' eq  and {
                        x x 1 add light2gether
                        "22" x soundlikethis
                        "22" x 1 add soundlikethis
                } if
        } for
```

```
} def

        // aw
/vpass33 {
        word wlen 2 sub get 'a' eq
        word wlen 1 sub get 'w' eq and {
                wlen 2 sub wlen 1 sub light2gether
                "40" wlen 2 sub soundlikethis
                "40" wlen 1 sub soundlikethis
        } if
} def

        // ai
/vpass34 {
        0 1     wlen 1 sub {
                /x exch def
                word x get 'a' eq  word x 1 add get 'i' eq  and {
                        x x 1 add light2gether
                        "26" x soundlikethis
                        "26" x 1 add soundlikethis
                } if
        } for
} def

        // oa
/vpass35 {
        0 1     wlen 1 sub {
                /x exch def
                word x get 'o' eq  word x 1 add get 'a' eq  and {
                        x x 1 add light2gether
                        "29" x soundlikethis
                        "29" x 1 add soundlikethis
                } if
        } for
} def

        // ea
/vpass36 {
        0 1     wlen 1 sub {
                /x exch def
                word x get 'e' eq  word x 1 add get 'a' eq  and {
                        x x 1 add light2gether
                        "27" x soundlikethis
                        "27" x 1 add soundlikethis
                } if
```

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```
        } for
} def

        // ould
/vpass37 {
        0 1     wlen 3 sub {
                /x exch def
                word x get 'o' eq  word x 1 add get 'u' eq  and {
                        word x 2 add get 'l' eq  word x 3 add get 'd' eq  and {
                                x x 1 add light2gether
                                "44" x soundlikethis
                                "44" x 1 add soundlikethis
                                "0" x 2 add soundlikethis
                                x 2 add x lightthistoo
                                x 2 add x 1 add lightthistoo
                                x 2 add x 3 add lightthistoo
                        } if
                } if
        } for
} def

        // tion
/vpass38 {
        0 1     wlen 3 sub {
                /x exch def
                word x get 't' eq  word x 1 add get 'i' eq  and {
                        word x 2 add get 'o' eq  word x 3 add get 'n' eq  and {
                                "20" x soundlikethis
                                "20" x 1 add soundlikethis
                                "36" x 2 add soundlikethis
                                x x 1 add x 2 add light3gether
                                x x 3 add lightthistoo
                                x 1 add x 3 add lightthistoo
                                x 3 add x 3 add lightthistoo
                        } if
                } if
        } for
} def

        // sion
/vpass39 {
        0 1     wlen 3 sub {
                /x exch def
                word x get 's' eq  word x 1 add get 'i' eq  and {
                        word x 2 add get 'o' eq  word x 3 add get 'n' eq  and {
```

```
                        "20" x soundlikethis
                        "20" x 1 add soundlikethis
                        "36" x 2 add soundlikethis
                        x x 1 add x 2 add light3gether
                        x x 3 add lightthistoo
                        x 1 add x 3 add lightthistoo
                        x 3 add x 3 add lightthistoo
                    } if
                } if
        } for
} def

        // cc[ei]
/vpass40 {
        0 1     wlen 2 sub {
                /x exch def
                word x get 'c' eq  word x 1 add get 'c' eq  and {
                    word x 2 add get 'e' eq
                    word x 2 add get 'i' eq and {
                        "7" x soundlikethis
                        "13" x 1 add soundlikethis
                        x x 1 add light2gether
                        x x 2 add lightthistoo
                        x 1 add x 2 add lightthistoo
                    } if
                } if
        } for
} def

        // oi
/vpass41 {
        0 1     wlen 1 sub {
                /x exch def
                word x get 'o' eq
                word x 1 add get 'i' eq and {
                    x wlen 3 sub ge {                   // if there can't be an 'ng'
                        "41" x soundlikethis
                        "41" x 1 add soundlikethis
                        x x 1 add light2gether
                    }{
                            // not n == false, not g == false
                        word x 2 add get 'n' ne
                        word x 3 add get 'g' ne or {
                            "41" x soundlikethis
                            "41" x 1 add soundlikethis
```

```
                                        x x 1 add light2gether
                                } if
                        } ifelse
                } if
        } for

} def

        // s at end
/vpass42 {
        word wlen 1 sub get 's' eq
        wlen 2 ge and {
                wlen 2 sub getthissound isvoiced {
                        "18" wlen 1 sub soundlikethis

                } {
                        wlen 3 ge {
                                wlen 2 sub getthissound issilent {
                                        wlen 3 sub getthissound isvoiced {
                                                "18" wlen 1 sub soundlikethis
                                        } if
                                } if
                        } if
                } ifelse
        } if
} def

        // tch
/vpass43 {
        2 1     wlen {
                /x exch def
                word x get 'h' eq {
                        word x 1 sub get 'c' eq
                        word x 2 sub get 't' eq
                        and {
                                "0" x 2 sub soundlikethis
                                x 2 sub x 1 sub lightthistoo
                                x 2 sub x lightthistoo
                        } if
                } if
        } for
} def

        // rh - kh
/vpass44 {
```

```
        1 1     wlen {
                /x exch def
                word x get 'h' eq {
                        word x 1 sub get 'r' eq
                        word x 1 sub get 'k' eq or {
                                "0" x soundlikethis
                                x x 1 sub lightthistoo
                        } if
                } if
        } for
} def


        // mb
/vpass45 {
        1 1     wlen {
                /x exch def
                word x get 'b' eq {
                        word x 1 sub get 'm' eq {
                                "0" x soundlikethis
                                x x 1 sub lightthistoo
                        } if
                } if
        } for
} def


        // lk - lm
/vpass46 {
        0 1     wlen 1 sub {
                /x exch def
                word x get 'l' eq {
                        word x 1 add get 'm' eq
                        word x 1 add get 'k' eq or {
                                "0" x soundlikethis
                                x x 1 add lightthistoo
                        } if
                } if
        } for
} def

        // bt at the end
/vpass47 {
        word wlen 1 sub get 't' eq
        word wlen 2 sub get 'b' eq and {
```

```
                "0" wlen 2 sub soundlikethis
                wlen 2 sub  wlen 1 sub lightthistoo
        } if
} def

        // mn
/vpass48 {
        0 1     wlen 1 sub {
                /x exch def
                word x get 'm' eq {
                        word x 1 add get 'n' eq {
                                "0" x 1 add soundlikethis
                                x 1 add x lightthistoo
                        } if
                } if
        } for
} def

        // vowel h at end
/vpass49 {
        word wlen 1 sub get 'h' eq {
                word wlen 2 sub get isvowel {
                        "0" wlen 1 sub soundlikethis
                        wlen 1 sub wlen 2 sub lightthistoo
                } if
        } if
} def

        // 'who' at beginning of word (must fix up wh rule)
/vpass50 {
        wlen 3 ge {
                word 0 get 'w' eq {
                        word 1 get 'h' eq
                        word 2 get '0' eq and {
                                "0" 0 soundlikethis
                                "5" 1 soundlikethis             // h back to before wh rule
                                0 1 lightthistoo
                                0 2 lightthistoo
                        } if
                } if
        } if
} def

        // d - j sound
/vpass100 {
```

```
        0 1     wlen 1 sub {
                /x exch def
                word x get 'd' eq {
                        x 1 add getthissound "6" eq {
                                "0" x soundlikethis
                                x x 1 add lightthistoo
                        } if
                } if
        } for
} def

        // ? sm
/vpass101 {
        1 1     wlen 1 sub {
                /x exch def
                word x get 's' eq  word x 1 add get 'm' eq  and {
                        x 1 sub getthissound isvoiced {
                                "18" x soundlikethis
                                x x 1 add lightthistoo
                                x x 1 sub lightthistoo
                        } if
                } if
        } for
} def




/lastpass {
        workingvword 2 get {
                itoahex
        } foreach
} def

/light2gether {
        /x1 exch def
        /x2 exch def
        /lights workingvword 2 get def
        lights x1 lights x1 get 1 x2 bitshift or put
        lights x2 lights x2 get 1 x1 bitshift or put
} def

/light3gether {
        /x3 exch def
```

```
        /x2 exch def
        /x1 exch def
        /lights workingvword 2 get def
        lights x1 lights x1 get 1 x2 bitshift or put
        lights x1 lights x1 get 1 x3 bitshift or put
        lights x2 lights x2 get 1 x1 bitshift or put
        lights x2 lights x2 get 1 x3 bitshift or put
        lights x3 lights x3 get 1 x1 bitshift or put
        lights x3 lights x3 get 1 x2 bitshift or put
} def


/lightthistoo {
        /x2 exch def
        /x1 exch def
        /lights workingvword 2 get def
        lights x1 lights x1 get 1 x2 bitshift or put
} def

/soundlikethis {
        /x1 exch def
        /xs exch def
        /sounds workingvword 1 get def
        sounds x1 xs put
} def

/getthissound {
        workingvword 1 get exch get
} def

/countvowels {
        0
        word {
                /x exch def
                x 'a' eq
                x 'e' eq or
                x 'i' eq or
                x 'o' eq or
                x 'u' eq or
                {
                        1 add
                } if
        } forall
} def
```

```
/vowels "aeiou" def

/isvowel {
        /l exch def
        false
        vowels {
                l eq or
        } forall
} def

/consonants "bcdfghjklmnpqrstvwxyz" def

/isconsonant {
        /l exch def
        false
        consonants {
                l eq or
        } forall
} def

/voiced [ "1" "2" "4" "6" "8" "9" "10" "12" "15" "16" "17" "18" "21" "23" "25" "26" "27" "28" "29"
"30" "31" "32" "33" "34" "35" "36" "37" "38" "39" "40" "41" "42" "43" "44" ] def

/isvoiced {
        /ss exch def
        false
        voiced {
                ss eq or
        } forall
} def

/issilent {
        "0" eq
} def



/dumpword {
        dup 0 get print
        dup 1 get { cvs ", " cat prin } forall
        "" print
        dup 2 get { cvs ", " cat prin } forall
        "" print
        3 get print
```

APPENDIX C

E.O.6920 "b"2706260

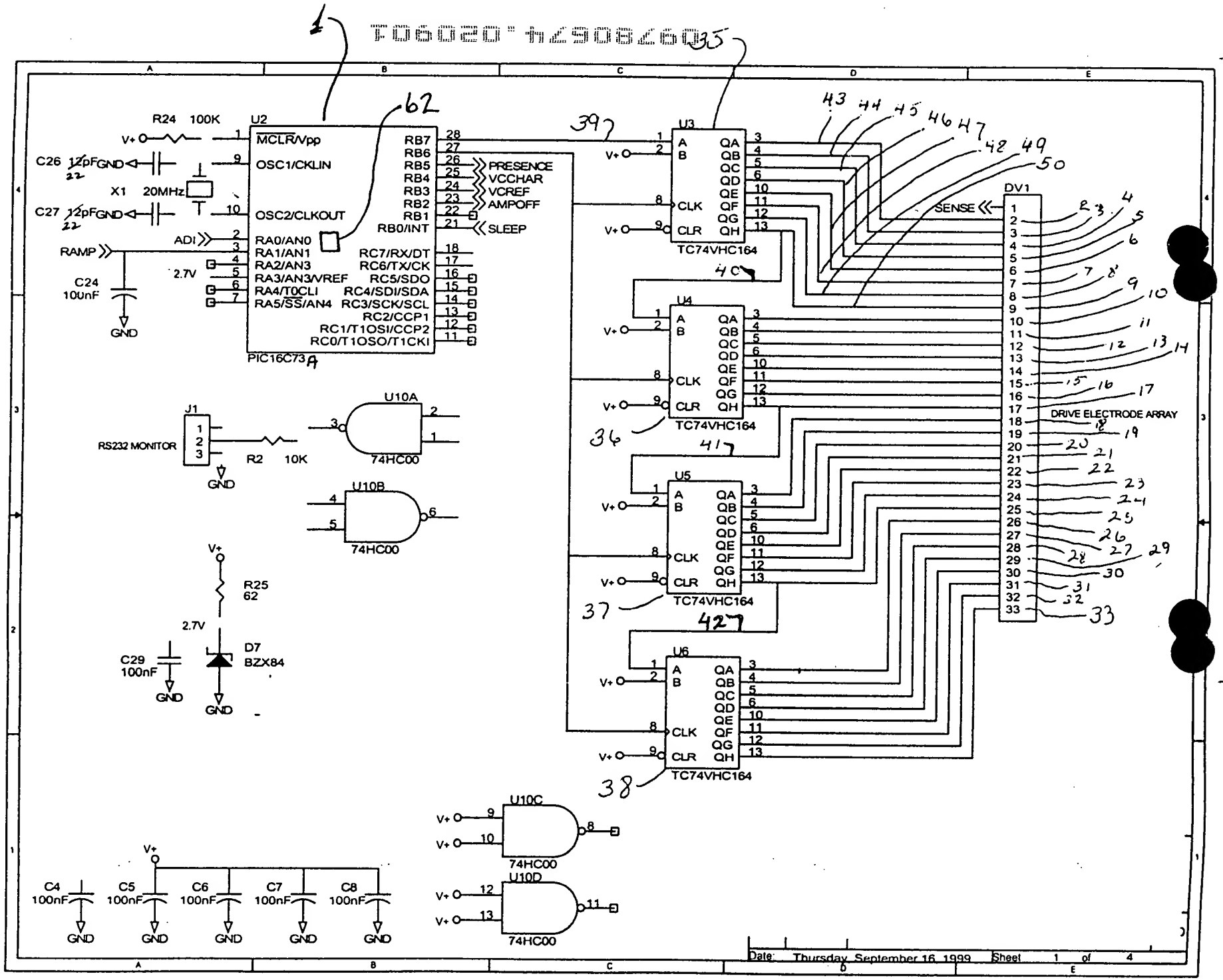
U2
PIC16C73A
R24 100K
C26 12pF
C27 12pF
X1 20MHz
C24 10UnF
RAMP
ADI
2.7V
GND
MCLR/Vpp
OSC1/CKLIN
OSC2/CLKOUT
RA0/AN0
RA1/AN1
RA2/AN3
RA3/AN3/VREF
RA4/T0CLI
RA5/SS/AN4
RB7
RB6
RB5
RB4
RB3
RB2
RB1
RB0/INT
RC7/RX/DT
RC6/TX/CK
RC5/SDO
RC4/SDI/SDA
RC3/SCK/SCL
RC2/CCP1
RC1/T1OSI/CCP2
RC0/T1OSO/T1CKI
PRESENCE
VCCHAR
VCREF
AMPOFF
SLEEP
U3
U4
U5
U6
TC74VHC164
A
B
CLK
CLR
QA
QB
QC
QD
QE
QF
QG
QH
DV1
SENSE
DRIVE ELECTRODE ARRAY
J1
RS232 MONITOR
R2 10K
U10A
U10B
U10C
U10D
74HC00
R25
62
D7
BZX84
C29 100nF
C4 100nF
C5 100nF
C6 100nF
C7 100nF
C8 100nF
Date: Thursday, September 16, 1999
Sheet 1 of 4

FIG. 2

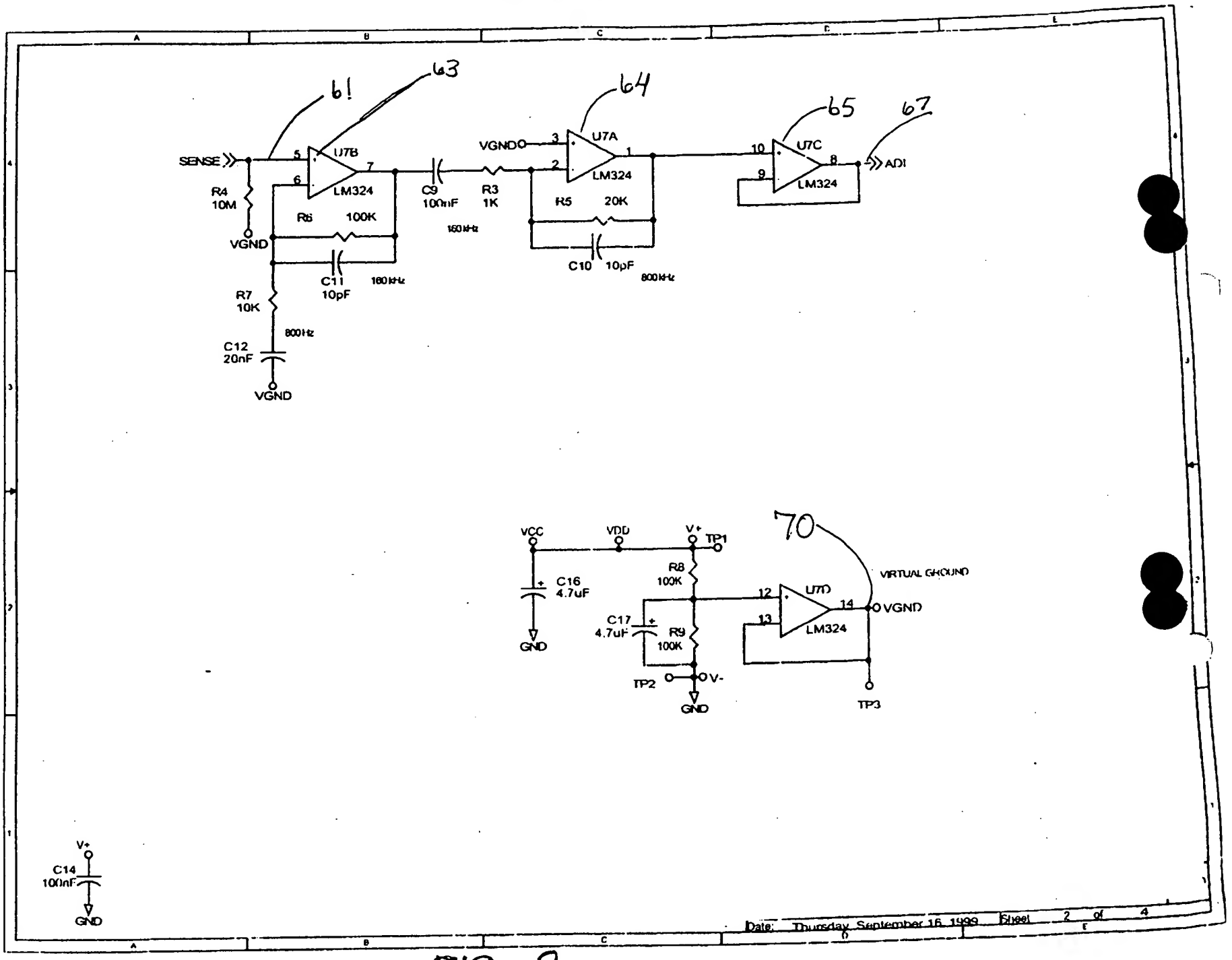
61
63
64
65
67
70
SENSE
U7B
LM324
R4
10M
R6
100K
VGND
C11
10pF
160kHz
R7
10K
800Hz
C12
20nF
VGND
C9
100nF
160kHz
R3
1K
VGNDO
U7A
LM324
R5
20K
C10
10pF
800kHz
U7C
LM324
ADI
VCC
VDD
V+
TP1
C16
4.7uF
GND
R8
100K
C17
4.7uF
R9
100K
TP2
V-
GND
U7D
LM324
VIRTUAL GHOUND
VGND
TP3
V+
C14
100nF
GND
Date: Thursday, September 16, 1999
Sheet 2 of 4

FIG. 3

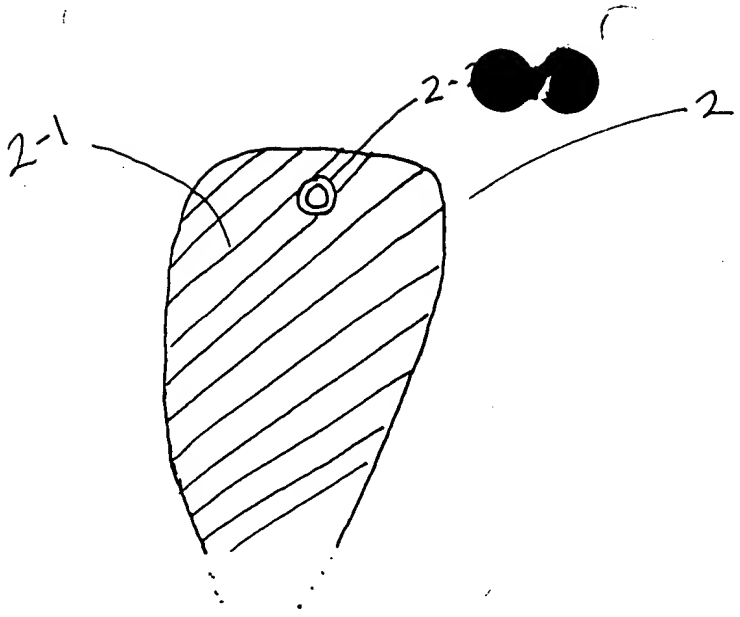

FiG. 4a

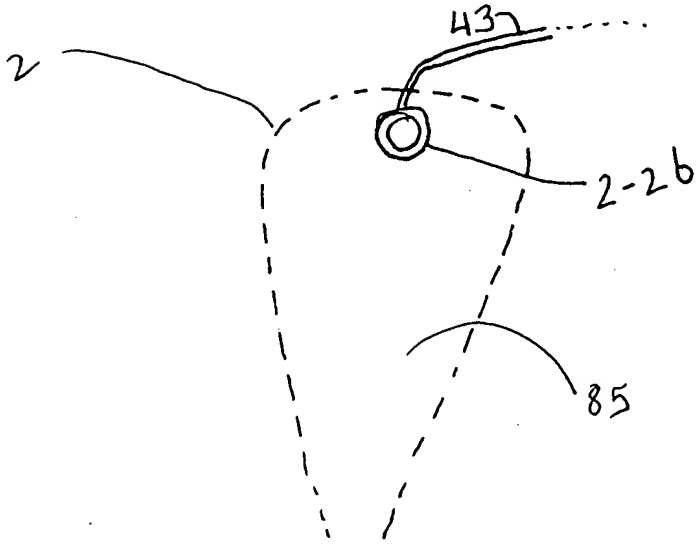

FiG. 4b

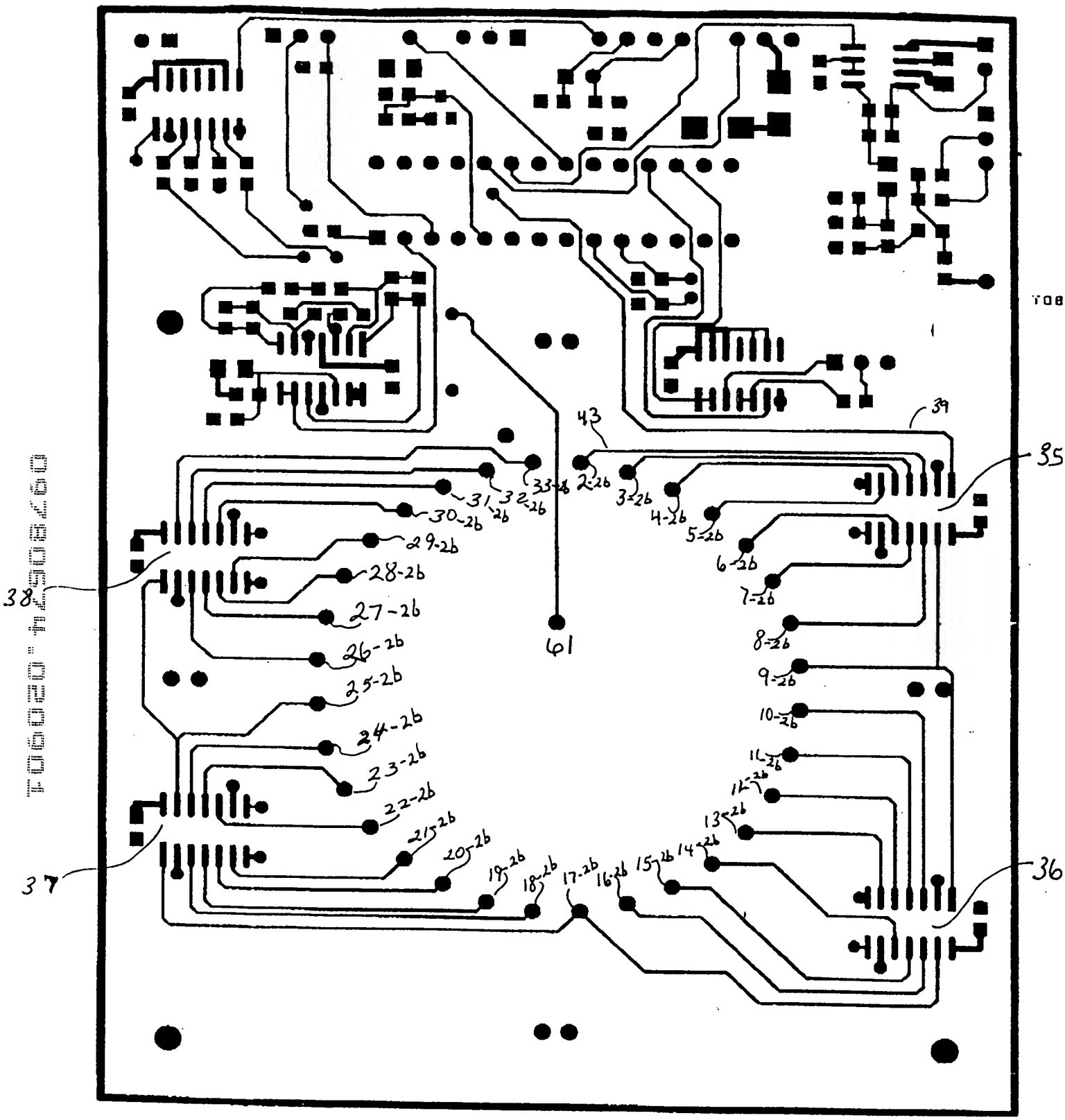
43
39
35
38
37
36
61
2-2b
3-2b
4-2b
5-2b
6-2b
7-2b
8-2b
9-2b
10-2b
11-2b
12-2b
13-2b
14-2b
15-2b
16-2b
17-2b
18-2b
19-2b
20-2b
21-2b
22-2b
23-2b
24-2b
25-2b
26-2b
27-2b
28-2b
29-2b
30-2b
31-2b
32-2b
33-2b

FIG. 6

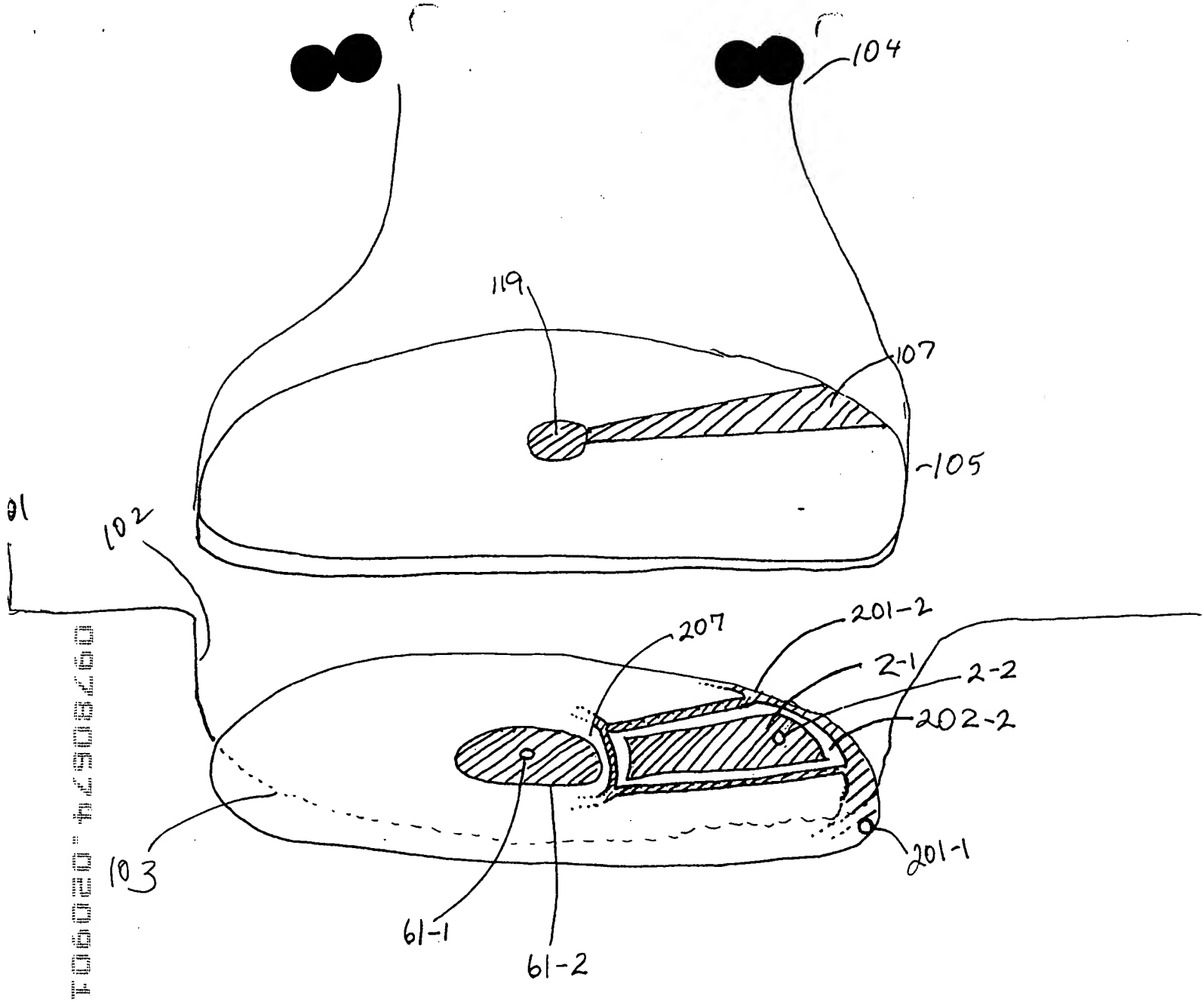

FIG. 11

T06020 "h2908260

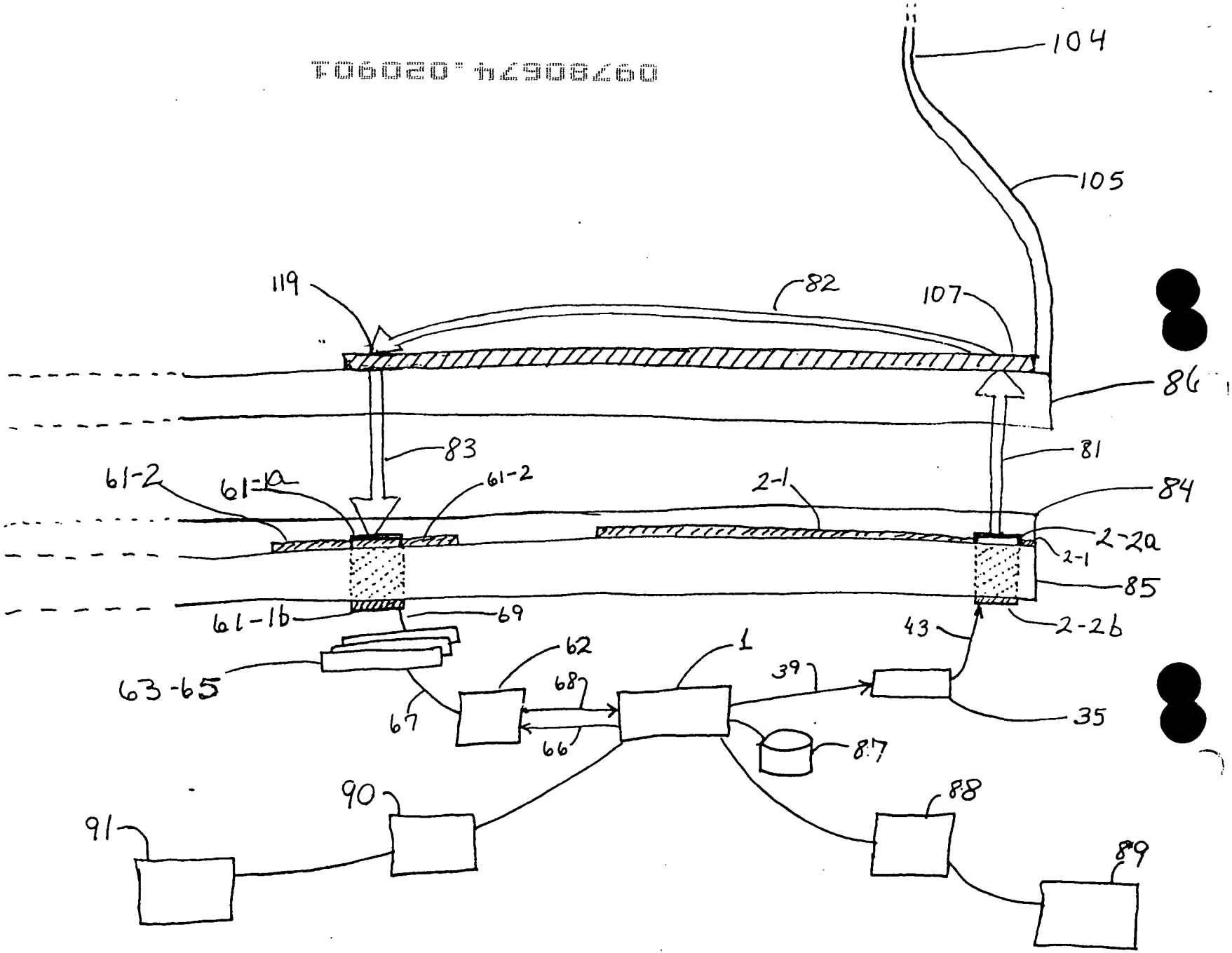

FIG. 12

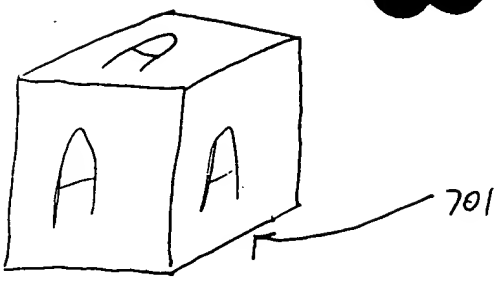

FIG. 20a

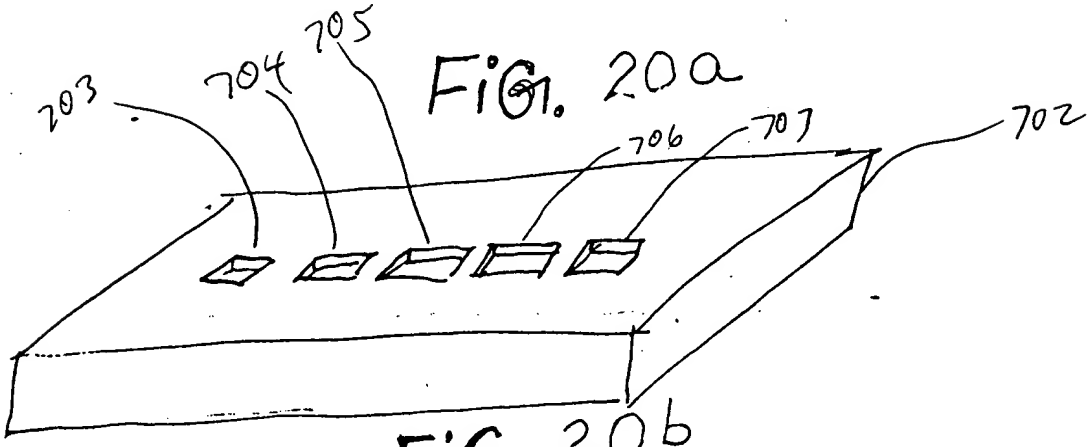

FIG. 20b

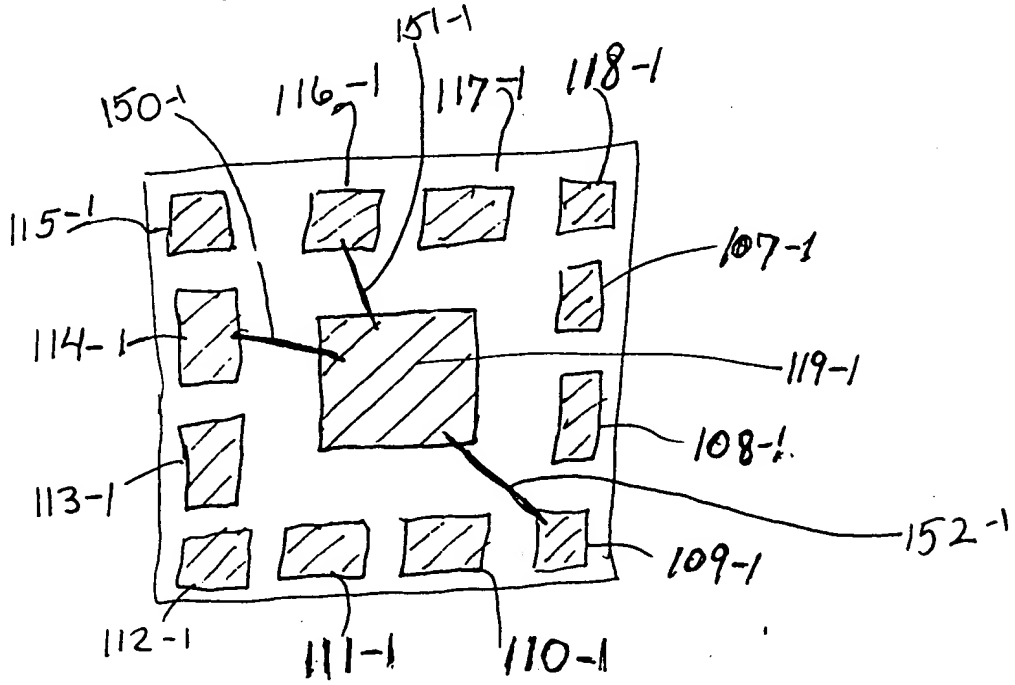

FIG. 20c

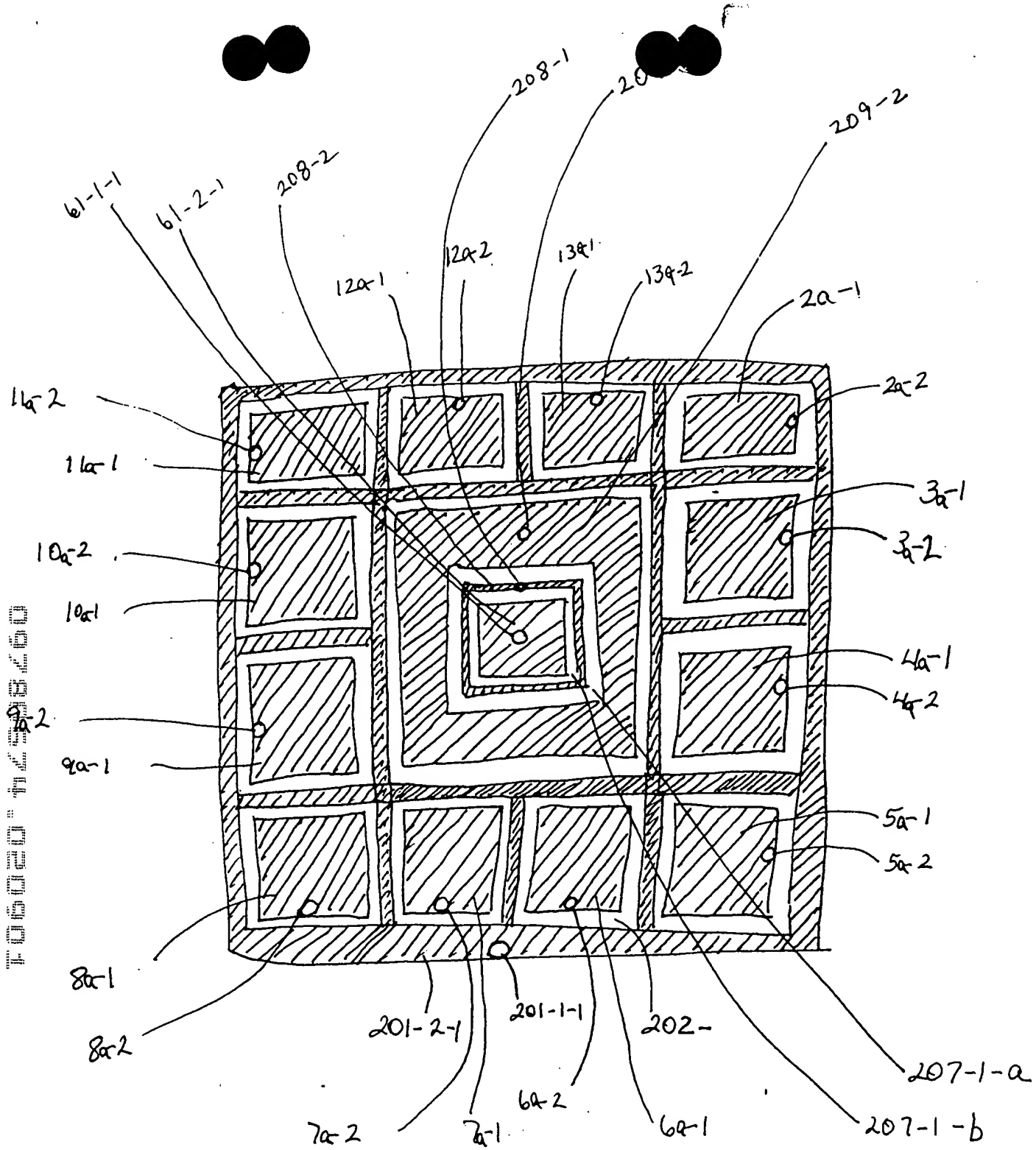
61-1-1
61-2-1
208-2
208-1
209-2
12a-1
12a-2
13a-1
13a-2
2a-1
2a-2
14a-2
11a-1
3a-1
3a-2
10a-2
10a-1
4a-1
4a-2
9a-2
9a-1
5a-1
5a-2
8a-1
8a-2
201-2-1
201-1-1
202-
207-1-a
6a-2
6a-1
207-1-b
7a-2
7a-1

FIG. 21a

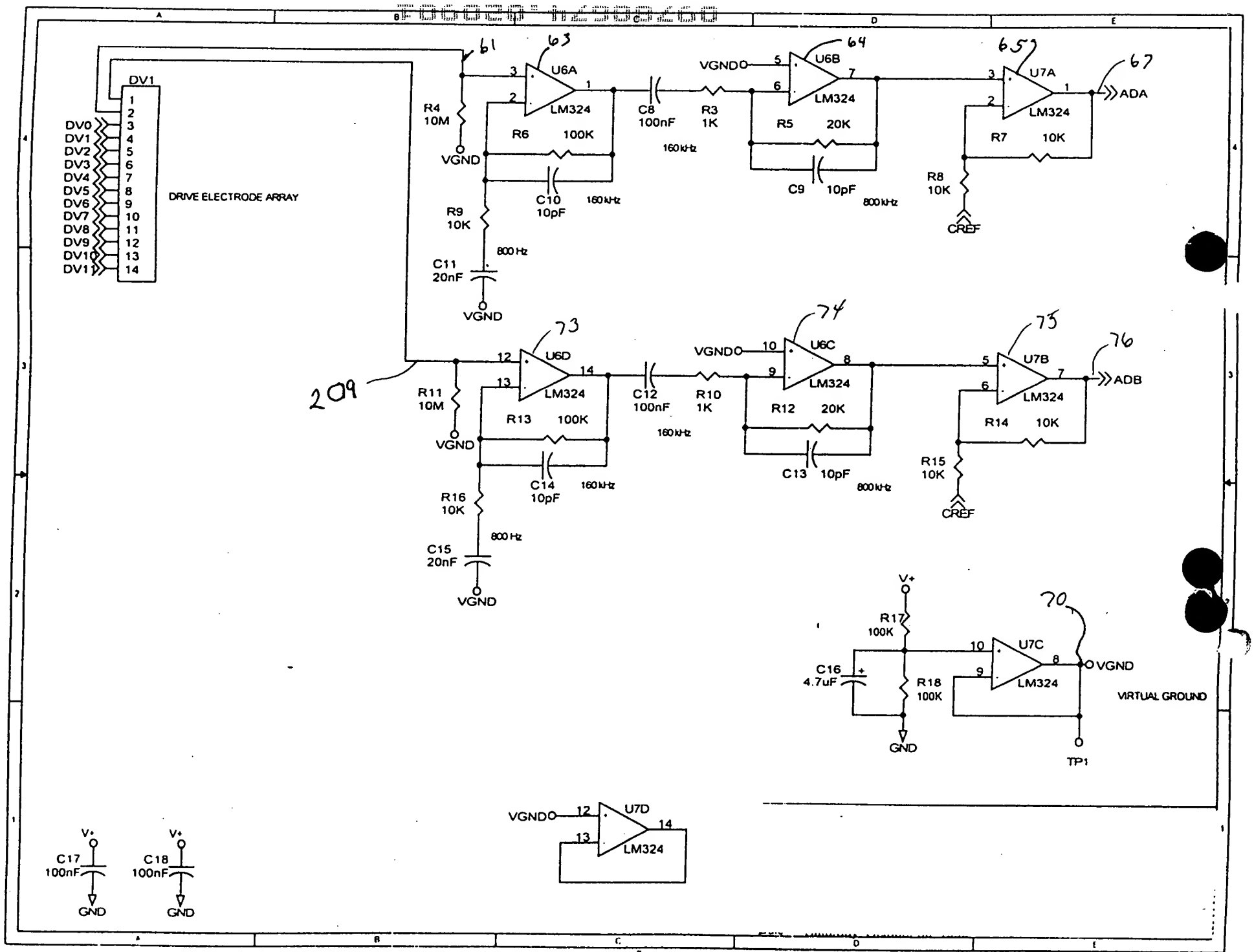
DV1
DV0
DV1
DV2
DV3
DV4
DV5
DV6
DV7
DV8
DV9
DV10
DV11
DRIVE ELECTRODE ARRAY
61
63
U6A
LM324
R4
10M
VGND
R6
100K
C10
10pF
160kHz
R9
10K
800 Hz
C11
20nF
VGND
C8
100nF
R3
1K
64
VGNDO
U6B
LM324
R5
20K
C9
10pF
800kHz
65
U7A
LM324
R7
10K
R8
10K
CREF
67
ADA
209
73
U6D
LM324
R11
10M
VGND
R13
100K
C14
10pF
160kHz
R16
10K
800 Hz
C15
20nF
VGND
C12
100nF
R10
1K
74
VGNDO
U6C
LM324
R12
20K
C13
10pF
800kHz
75
U7B
LM324
R14
10K
R15
10K
CREF
76
ADB
V+
R17
100K
C16
4.7uF
R18
100K
GND
70
U7C
LM324
VGND
VIRTUAL GROUND
TP1
V+
C17
100nF
GND
V+
C18
100nF
GND
VGNDO
U7D
LM324

FIG 21b

APPENDIX D

E6000-0000-0000-0000

```
/Alphabet 50 dict dup begin
        'a'     aDict def
        'b'     bDict def
        'c'     cDict def
        'd'     dDict def
        'e'     eDict def
        'f'     fDict def
        'g'     gDict def
        'h'     hDict def
        'i'     iDict def
        'j'     jDict def
        'k'     kDict def
        'l'     lDict def
        'm'     mDict def
        'n'     nDict def
        'o'     oDict def
        'p'     pDict def
        'q'     qDict def
        'r'     rDict def
        's'     sDict def
        't'     tDict def
        'u'     uDict def
        'v'     vDict def
        'w'     wDict def
        'x'     xDict def
        'y'     yDict def
        'z'     zDict def
        end
def


} def
```

Exhibit "A" 5086250

```
/aDict LetterObj subclass dup begin
        /isvowel { true } def
        /snorm "31" def
        /sounds [
                "31"
                wavname
                readwav not { "readwav error" logstring } if
                dup buildwav not { "buildwav error" logstring } if
                "style1_a"
                wavname
                readwav not { "readwav error" logstring } if
                dup buildwav not { "buildwav error" logstring } if
        ] def
        end
def
```

F-0000-PVS-0000

```
/bDict LetterObj subclass dup begin
        /isvowel { false } def
        /snorm "1" def
        /sounds [
                "1"
                wavname
                readwav not { "file error" logstring } if
                dup buildwav not { "buildwav error" logstring } if
                "style1_b"
                wavname
                readwav not { "file error" logstring } if
                dup buildwav not { "buildwav error" logstring } if
        ] def
        end
def
/cDict LetterObj subclass dup begin
        /isvowel { false } def
        /snorm "7" def
        /sounds [
                "7"
                wavname
                readwav not { "file error" logstring } if
                dup buildwav not { "buildwav error" logstring } if
                "style1_c"
                wavname
                readwav not { "file error" logstring } if
                dup buildwav not { "buildwav error" logstring } if
        ] def
        end
def
/dDict LetterObj subclass dup begin
        /isvowel { false } def
        /snorm "2" def
        /sounds [
                "2"
                wavname
                readwav not { "file error" logstring } if
```

```
                dup buildwav not { "buildwav error" logstring } if
                "style1_d"
                wavname
                readwav not { "file error" logstring } if
                dup buildwav not { "buildwav error" logstring } if
        ] def
        end
def
/eDict LetterObj subclass dup begin
        /isvowel { true } def
        /snorm "32" def
        /sounds [
                "32"
                wavname
                readwav not { "file error" logstring } if
                dup buildwav not { "buildwav error" logstring } if
                "style1_e"
                wavname
                readwav not { "file error" logstring } if
                dup buildwav not { "buildwav error" logstring } if
        ] def
        end
def
/fDict LetterObj subclass dup begin
        /isvowel { false } def
        /snorm "3" def
        /sounds [
                "3"
                wavname
                readwav not { "file error" logstring } if
                dup buildwav not { "buildwav error" logstring } if
                "style1_f"
                wavname
                readwav not { "file error" logstring } if
                dup buildwav not { "buildwav error" logstring } if
        ] def
        end
def
/gDict LetterObj subclass dup begin
        /isvowel { false } def
        /snorm "4" def
        /sounds [
                "4"
                wavname
                readwav not { "file error" logstring } if
```

```
                dup buildwav not { "buildwav error" logstring } if
                "style1_g"
                wavname
                readwav not { "file error" logstring } if
                dup buildwav not { "buildwav error" logstring } if
        ] def
        end
def
/hDict LetterObj subclass dup begin
        /isvowel { false } def
        /snorm "5" def
        /sounds [
                "5"
                wavname
                readwav not { "file error" logstring } if
                dup buildwav not { "buildwav error" logstring } if
                "style1_h"
                wavname
                readwav not { "file error" logstring } if
                dup buildwav not { "buildwav error" logstring } if
        ] def
        end
def
/iDict LetterObj subclass dup begin
        /isvowel { true } def
        /snorm "33" def
        /sounds [
                "33"
                wavname
                readwav not { "file error" logstring } if
                dup buildwav not { "buildwav error" logstring } if
                "style2_i"
                wavname
                readwav not { "file error" logstring } if
                dup buildwav not { "buildwav error" logstring } if
        ] def
        end
def
/jDict LetterObj subclass dup begin
        /isvowel { false } def
        /snorm "6" def
        /sounds [
                "6"
                wavname
                readwav not { "file error" logstring } if
```

```
                dup buildwav not { "buildwav error" logstring } if
                "style2_j"
                wavname
                readwav not { "file error" logstring } if
                dup buildwav not { "buildwav error" logstring } if
        ] def
        end
def
/kDict LetterObj subclass dup begin
        /isvowel { false } def
        /snorm "7" def
        /sounds [
                "7"
                wavname
                readwav not { "file error" logstring } if
                dup buildwav not { "buildwav error" logstring } if
                "style2_k"
                wavname
                readwav not { "file error" logstring } if
                dup buildwav not { "buildwav error" logstring } if
        ] def
        end
def
/lDict LetterObj subclass dup begin
        /isvowel { false } def
        /snorm "8" def
        /sounds [
                "8"
                wavname
                readwav not { "file error" logstring } if
                dup buildwav not { "buildwav error" logstring } if
                "style2_l"
                wavname
                readwav not { "file error" logstring } if
                dup buildwav not { "buildwav error" logstring } if
        ] def
        end
def
/mDict LetterObj subclass dup begin
        /isvowel { false } def
        /snorm "9" def
        /sounds [
                "9"
                wavname
                readwav not { "file error" logstring } if
```

```
                dup buildwav not { "buildwav error" logstring } if
                "style2_m"
                wavname
                readwav not { "file error" logstring } if
                dup buildwav not { "buildwav error" logstring } if
        ] def
        end
def
/nDict LetterObj subclass dup begin
        /isvowel { false } def
        /snorm "10" def
        /sounds [
                "10"
                wavname
                readwav not { "file error" logstring } if
                dup buildwav not { "buildwav error" logstring } if
                "style2_n"
                wavname
                readwav not { "file error" logstring } if
                dup buildwav not { "buildwav error" logstring } if
        ] def
        end
def
/oDict LetterObj subclass dup begin
        /isvowel { true } def
        /snorm "34" def
        /sounds [
                "34"
                wavname
                readwav not { "file error" logstring } if
                dup buildwav not { "buildwav error" logstring } if
                "style3_o"
                wavname
                readwav not { "file error" logstring } if
                dup buildwav not { "buildwav error" logstring } if
        ] def
        end
def
/pDict LetterObj subclass dup begin
        /isvowel { false } def
        /snorm "11" def
        /sounds [
                "11"
                wavname
                readwav not { "file error" logstring } if
```

```
                dup buildwav not { "buildwav error" logstring } if
                "style3_p"
                wavname
                readwav not { "file error" logstring } if
                dup buildwav not { "buildwav error" logstring } if
        ] def
        end
def
/qDict LetterObj subclass dup begin
        /isvowel { false } def
        /snorm "46" def
        /sounds [
                "46"
                wavname
                readwav not { "file error" logstring } if
                dup buildwav not { "buildwav error" logstring } if
                "style3_q"
                wavname
                readwav not { "file error" logstring } if
                dup buildwav not { "buildwav error" logstring } if
        ] def
        end
def
/rDict LetterObj subclass dup begin
        /isvowel { false } def
        /snorm "12" def
        /sounds [
                "12"
                wavname
                readwav not { "file error" logstring } if
                dup buildwav not { "buildwav error" logstring } if
                "style3_r"
                wavname
                readwav not { "file error" logstring } if
                dup buildwav not { "buildwav error" logstring } if
        ] def
        end
def
/sDict LetterObj subclass dup begin
        /isvowel { false } def
        /snorm "13" def
        /sounds [
                "13"
                wavname
                readwav not { "file error" logstring } if
```

```
                dup buildwav not { "buildwav error" logstring } if
                "style3_s"
                wavname
                readwav not { "file error" logstring } if
                dup buildwav not { "buildwav error" logstring } if
        ] def
        end
def
/tDict LetterObj subclass dup begin
        /isvowel { false } def
        /snorm "14" def
        /sounds [
                "14"
                wavname
                readwav not { "file error" logstring } if
                dup buildwav not { "buildwav error" logstring } if
                "style3_t"
                wavname
                readwav not { "file error" logstring } if
                dup buildwav not { "buildwav error" logstring } if
        ] def
        end
def
/uDict LetterObj subclass dup begin
        /isvowel { true } def
        /snorm "35" def
        /sounds [
                "35"
                wavname
                readwav not { "file error" logstring } if
                dup buildwav not { "buildwav error" logstring } if
                "style4_u"
                wavname
                readwav not { "file error" logstring } if
                dup buildwav not { "buildwav error" logstring } if
        ] def
        end
def
/vDict LetterObj subclass dup begin
        /isvowel { false } def
        /snorm "15" def
        /sounds [
                "15"
                wavname
                readwav not { "file error" logstring } if
```

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```
                dup buildwav not { "buildwav error" logstring } if
                "style4_v"
                wavname
                readwav not { "file error" logstring } if
                dup buildwav not { "buildwav error" logstring } if
        ] def
        end
def
/wDict LetterObj subclass dup begin
        /isvowel { false } def
        /snorm "16" def
        /sounds [
                "16"
                wavname
                readwav not { "file error" logstring } if
                dup buildwav not { "buildwav error" logstring } if
                "style4_w"
                wavname
                readwav not { "file error" logstring } if
                dup buildwav not { "buildwav error" logstring } if
        ] def
        end
def
/xDict LetterObj subclass dup begin
        /isvowel { false } def
        /snorm "47" def
        /sounds [
                "47"
                wavname
                readwav not { "file error" logstring } if
                dup buildwav not { "buildwav error" logstring } if
                "style4_x"
                wavname
                readwav not { "file error" logstring } if
                dup buildwav not { "buildwav error" logstring } if
        ] def
        end
def
/yDict LetterObj subclass dup begin
        /isvowel { false } def
        /snorm "17" def
        /sounds [
                "17"
                wavname
                readwav not { "file error" logstring } if
```

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```
                dup buildwav not { "buildwav error" logstring } if
                "style4_y"
                wavname
                readwav not { "file error" logstring } if
                dup buildwav not { "buildwav error" logstring } if
        ] def
        end
def
/zDict LetterObj subclass dup begin
        /isvowel { false } def
        /snorm "18" def
        /sounds [
                "18"
                wavname
                readwav not { "file error" logstring } if
                dup buildwav not { "buildwav error" logstring } if
                "style4_z"
                wavname
                readwav not { "file error" logstring } if
                dup buildwav not { "buildwav error" logstring } if
        ] def
        end
  def
```